Sample Final Exam
MAT 515, Fall 2019
December 11, 2019
Stony Brook University

Name: **ID #:**

(please print)

	1	2	3	4	5	6	7	8	9	**Total**
	10pts	10pts	10pts	10pts	12pts	12pts	12pts	12pts	12pts	100pts
Grade										

No notes or books.

You must provide explanation, not just the answer (unless otherwise is stated).

Answers without justification will get only partial credit.

Please cross out anything that is not a part of your solution — e.g., some preliminary computations that you didn't need.

Instructor: Dzmitry Dudko

1. *(10 pts)*

Indicate whether each of the statements below is True **(T)** or False **(F)**.
No explanation is required.

(a) There is a triangle ABC such that $AB = 4$, $AC = 6$, and $BC = 9$.

(b) In a triangle ABC, the external angle of A is equal to the sum of the internal angles of B and C.

(c) Suppose $AB > BC$ in a triangle ABC. Then $\angle C > \angle A$.

(d) There is a right triangle ABC such that $\angle A = 60°$ and $\angle B = 50°$.

(e) Let AB and CD be two chords of a circle with center O. If $AB > CD$, then the distance between O and AB is greater than the distance between O and CD.

(f) The sum of opposite angles in a parallelogram is $180°$.

(g) There is a triangle that has 6 axes of symmetry.

(h) A square is an inscribed and circumscribed quadrilateral.

(i) If $ABCD$ is a rectangle, then the distance between A and B is equal to the distance between AD and BC.

(j) A median always splits a triangle into two similar triangles.

2. *(10 pts)*

On the figure below $\angle BKC = 20°, \angle ADC = 50°$ and BK, AD are diameters.
Compute $\angle BAD$.
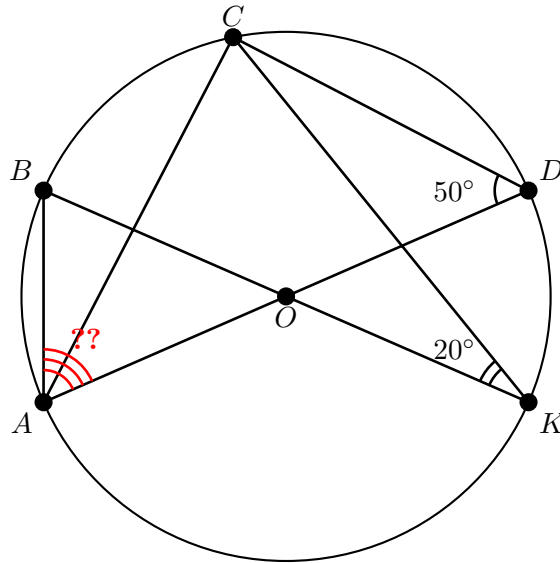
3. *(10 pts)*

Let $ABCD$ be a trapezoid with parallel bases AB and CD. Prove that the internal angle bisectors of the angles adjacent to the lateral side BC are perpendicular to each other.

4. *(10 pts)*

Let $ABCD$ be a circumscribed trapezoid with perimeter 4 (i.e., $AB+BC+CD+DA = 4$). What is the length of the midline of $ABCD$?

5. *(12 pts)*

Consider a triangle ABC. Suppose that M is the intersection of the medians of $\triangle ABC$ and N is the intersection of the altitudes of $\triangle ABC$. Show that if $N = M$, then $\triangle ABC$ is equilateral.

6. *(12 pts)*

Four houses A, B, C, D form vertices of a square. The residents would like to dig a well at a point W such that the sum of distances AW +BW +CW + DW from all the houses to the well is the smallest possible. Where should they dig the well?

7. *(12 pts)*

Construct a trapezoid $ABCD$ with bases $BC < AD$, given AB, BC, CD, DA.

8. *(12 pts)*

Let PA and PB be two tangents from point P to a given circle such that points A and B are the points of tangency. Construct a circle tangent to the given circle and to both lines PA and PB.

9. *(6+6 pts)*

Consider a triangle ABC and let D be a point on the side AC. Suppose $AB = 20$, $AD = 16$, $BD = 12$, $DC = 9$.

(a) Prove that $\triangle ABD$ is right.

(b) Compute BC.